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Continuing Education Column

원외 획득 폐렴

Community Acquired Pneumonia

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Abstract

Community acquired pneumonia is a common disease, and it is usually managed by empirical antibiotics therapy from several management guidelines. It is challenged by emergence of drug resistant bacterial strains, especially *Streptococcus pneumoniae* and recent increasing recognition for the mixed infection by atypical pneumonia pathogens such as *Mycoplasma*, *Chlamydia* and *Legionella* species. Even though community acquired pneumoniae caused by drug resistant *S. pneumoina* is common in Korea, the treatment results are good with current antibiotics. This review deals with important new findings and management issues of community acquired pneumonia in immunocompetent adults.

Keywords : **Community acquired pneumonia**

1
1/5
가 1~5%
12%
(1,
2). macolides, ketolides, fluoroquinolones,
carbapenems(meropenem, imipenem), linezolid
90
S. pneumoniae
가 10
S. pneumoniae 가
가
4 (1~4).

1.

(2)

Streptococcus pneumoniae (*S. pneumoniae*), Anaerobes, Gram negative bacilli, *Mycobacterium tuberculosis*

/ *S. pneumoniae, Hemophilus influenzae, Moraxella catarrhalis, Legionella* species

Anaerobes

Influenza, *S. pneumoniae, Staphylococcus aureus, H. influenzae*

Anaerobes, chemical pneumonitis,

() *P. aeruginosa, Pseudomonas cepacia, S. aureus*

S. aureus, anaerobes, , Pneumocystis carinii

Anaerobes

S. pneumoniae, P. aeruginosa

S. pneumoniae, Hemophilus influenzae,

(重症度),

Moraxella catarrhalis

Legionella,

Klebsiella

가

(1~4).

가

가

가

(1)(4).

가

가

가

가

가

가

가

S. pneumoniae 80%

(single rigor)

(vi-

가

rulence),

가

(fine crackles) 80%
Mycoplasma, Legionella, Chlamydia
Legionella
 AIDS 가 가 . *Mycoplasma pneumoniae*
 bronchial breath sounds, egophony((consolidation)
 80%, 30%
 60~80%, 30%, 40~50%, (rigor) 15%
 1. *S. pneumoniae*
 가 . *H. influenzae, S. aureus, S. pneumoniae*
 가
 45~69%, 100 24 45%
Mycoplasma Legionella influenza 가
 가
 1 가 10 가 ,
 () virus, 가
Mycoplasma, Chlamydia, Tularemia, Legionella 1990
 . *S. pneumoniae* (atypical pathogen pneumonia)
 40% 가 가
 가 . *Mycoplasma pneumoniae, Chlamydia pneumoniae, Legionella species*
 가

3~40%

) , , ,

(20~40%), phosphorus , CPK 가, lactic dehydrogenase >700U/ml,

Legionella

(2). Macrolide가 가

2~6%

quinolone

가 (2).

2.

가 , (dependent part) . Trans-tracheal aspirate

가 (oximetry 가),

가 30%

(CBC), 2

가가

15,000~30,000/mm³

coliform bacteria

60%

가

가

가

가

(2, 4).

가

90%가

40~65%

(4).

, 40~45%

가

3. Legionella sp.

Legionella sp.

(40) ,

가

(

(2).

4). *Legionella* (2, , penicillin *S. pneumoniae* .

2. . ≥ 25

1. < 10 ,

10~30%, 24 , *P. carinii* 85%

가 , (*Legionella*, influenza virus, , *P. carinii*)가 가 .

1~2 가 , 2~5 . *S. pneumoniae* Hemophilus

(colonization) .

. *S. pneumoniae* *Legionella*가 *S. pneumoniae* Hemophilus 가

가 . *Enterobacteriaceae* *S. aureus*

가 *Enterobacteriaceae* *S. aureus*

가 가 가

가 가

10~14 4~6 가

40 , IgG 4 가

, β -lactam

Legionella . MIF .

direct immunofluorescent anti- IgG 4 가 IgM 1:16

body staining 25~75%, 99.9% . IgG 1

L. pneumophila . 가 2

Legionella 70% *L. pneumophila* 4 가

subgroup 1 ELISA plate (4). 1

IgM 3 , IgG 8

50~60%, 95% . *L. pneumophila* sub- 가

group 1 *C. pneumoniae* . IgG

Legionella 가 가 IgM 가

(2).

Legionella

1:256

Cold agglutinin 1:64 *M. pneumo-* 가 , 가

niae 가 30~60% 15% . IgM IgG

가 . *M. pneumoniae* IgM 가 가 .

1 가 2~12

가 7~10 5. 가

3 . *Mycoplasma*

가 가 .

mycoplasma

mycoplasma , ,

가 .

Chlamydia Legionella . *P. carinii*, *Mycobacterium* species,

cytomegalovirus ,

(2, 4). *Legionella* sp., ,

C. pneumoniae MIF IgM , , ,

PCR 가 . .

, , ,
 .
 M. pneumoniae,
 C. pneumoniae, respiratory viruses,

(1).

가

가

가

S. pneumoniae 26.8% 가 , Klebsiella pneumoniae 18.1%, Pseudomonas aeruginosa 11.8%, S. aureus 11.4% . 250 PCR Mycoplasma pneumoniae 9.2% C. pneumoniae 13.2%

가

, Legionella spp. 2.3%

10.1%

S. pneumoniae

가

가

. S. pneumoniae

34.3%,

가

가

가 가

가

8

(10, 11).

가

30

가

4

(2,

4).

(2).

)

(4).

4

(

8

S. pneumoniae H. influenzae

가

S. pneumoniae

(Drug Resistant Pneumococcus, DRSP)

Quellung

capsular polysaccharide

가

(10,

Penicillin

(minimal inhibitory concentration, MIC)가

11).

0.06 µg/ml

가

, 0.12 ~ 1.0 µg/ml

()

, 2.0 µg/ml

, 585

32.6% (15).

가

penicillin MIC 4.0 µg/ml

(2). (16). , , macrolide
S. pneumoniae
cephalosporins , 가
cephalosporin *S. pneumoniae* 가
가 . (17).
DRSP DRSP 3
가 (2). , 65 ,
DRSP , ,
β - lactam , ,
가 가 4 (2)(2).
MIC 4.0μg/ml DRSP cephalosporin β - lactams, sul-
가 famethoxazole/trimethoprim, macrolide, doxycycline
S. pneu-
moniae 1μg oxacillin disk 99%
, ,
S. pneumoniae penicillin 가 80% 가
80% 20% (3). MIC
, ,
65% 가 Penicillin penicillin
amoxicillin(500~1,000mg 8)
, cephalosporins macolides
. Ceftriaxone cefotaxime
S. pneumoniae MIC 1.0μg/ml , 2μg/ml
106 *S. pneu-* , 4μg/ml ,
moniae MIC 2.0μg/ml imi-
penem/cilastin (4).
가 (16). Penicillin MIC 4.0μg/ml
S. pneumoniae 가 21 () fluoroquinolone, vancomycin, clin-
damycin (2). *S. pneumoniae*
233 *S. pneumoniae* fluoroquinolone gatifloxacin
128 (55%) (1 400mg 1), gemifloxacin(320mg 1 1), levo-

2. 가 (2)

1. *S. pneumoniae*
 65
 3 β -lactam
 alcoholism
 ()

2. (nursing home)

3. *Pseudomonas aeruginosa*
 (,)
 1 10mg prednisone
 1 1

profloxacin
 quinolone (2), 가
 10%
 가
 levofloxacin fluoroquinolone
 Ketolides telithromycin(800mg 1 1)
H. influenzae
 가 .
 . Linezolid(600mg 2)가 DRSP
 가 . Vancomycin

floxacin(1 750mg 1), moxifloxacin(1 400mg
 1) (2, 4). moxifloxacin
 . Gatifloxacin gemifloxacin long
 QT , 가 long QT 가
 . Gemi-
 floxacin 가 가 가
 . Gatifloxacin 가 .
 Levofloxacin 750mg
 (4).
 Fluoroquinolone 가
 가 . cipro-
 floxacin *S. pneumoniae*
 fluoroquinolone
 가 . levofloxacin
 1 500mg
 750mg (18). ci-

(2). Penicillin *S. pneumoniae* 89%가
S. pneumoniae
 (4).
 Macrolide/azalide
 가 in vivo - in
 vitro - paradox가 . macrolide
 MIC 8 μ g/ml macrolide
 가 (18).
H. influenzae
*H. influenzae*가 50% , 30%
 β -lactamase (1),
 2/3 cephalosporin, amoxicillin/clavulanic
 acid, ampicillin/sulbactam, doxycycline, fluoro-
 quinolone . , .
 3 cephalosporin .
 sulfamethoxazole/trimethoprim

azithromycin (4, 13).
 1 clarithromycin 500mg /
 2 .
 3 ,
 10~14 (4, 13).
 21 가 .
 Azithromycin 5~10 (13).
 (1).
 , clindamycin 가
 penicillin G . Metronidazole
 microaerophilic strepto-
 cocci . Metronidazole peni- . 1 가
 cillin , amoxicillin/clavulanic acid , , ,
 .
 imipenem, meropenem, chloramphenicol, . 50
 β -lactam/ β -lactamase inhibitor . , , , ,
 clindamycin 가 5 ,
 metronidazole penicillin , amoxicillin/clavuli- , I . 2
 nic acid (2, 4).
 PORT Severity Index(PSI)
 II~V (3, 4). I, II
 , IV V .
 III 가
 (4). 3 가
Legionella sp.
 erythromycin 2~4g \pm rifampicin),
 (300mg 2 600mg 1) fluoro- . PSI
 quinolone(ciprofloxacin 400mg 8 I~III (2, 4).
 750mg 12 , levofloxacin 500mg
 1) (12). erythromycin , , , 1
 azithromycin 500mg / , 2 , ,

3. PORT (Pneumonia Outcome Research Team) (PSI)

	()
	() - 10
	+10
	+30
	+20
	+10
	+10
	+10
	+20
≥ 30 /	+20
< 90mmHg	+20
< 35 °C ≥ 40 °C	+15
≥ 125 /	+10
pH < 7.35	+30
BUN > 30mg/dL	+20
Sodium < 130mEq/L	+20
Glucose > 250mg/dL	+10
Hematocrit < 30%	+10
PaO ₂ < 60mmHg or SpO ₂ < 90%	+10
Pleural effusion	+10

(2).

Minor criteria

> 30, PaO₂/FiO₂ ratio < 250

mmHg,

, 90mmHg

60mmHg 5, Major criteria

, 48 가 50%

가, 4

, creatinine > 2mg/dL

4. PSI

Algorithm*	0.1%
≤ 70	0.6%
71~90	2.8%
91~130	8.2%
>130	29.2%

*

4 minor cri-
teria 2 major criteria 1

Group I. 가 가

*Streptococcus pneumoniae, Mycoplasma pneumo-
niae, Chlamydia pneumoniae, respiratory viruses*가

1%

Legionella sp.(), *Mycobacterium
tuberculosis* (5). 1~5%

50~90%

(2). *H. influenzae*가

가 가 (2).

macrolide

, 가 macrolide 가

doxycycline (5).

H. influenzae clarithromycin azithromy-
cin

(2).

erythromycin macrolide

doxycycline macrolide

<i>Streptococcus pneumoniae</i>	1. macrolide :	가. :
<i>Mycoplasma pneumoniae</i>	Azithromycin or	macrolide(erythromycin) doxycy-
<i>Chlamydia pneumoniae</i>	Clarithromycin*	cline
()	2. Doxycycline †	. (6.
<i>Hemophilus influenzae</i>		Group)):
Respiratory virus		1. fluoroquinolone
: <i>Legionella</i> ,		2. macrolide plus
		amoxicillin §
		3. macrolide plus
		amox./clavulanic acid

* Erythromycin *Hemophilus influenzae*

† *Streptococcus pneumoniae* 가 doxycycline

macrolide가 가 macrolide 가

§ amoxicillin 1g 3 8

** amoxicillin/clavulanic acid : 3 amoxicillin 3-4g amoxicillin 가, amoxicillin 875mg/clavulanic acid
125mg extended release 2 2

erythromycin *in vitro* *H. influenzae*
*S. pneumoniae*가 tetracyclines
 Group II(6) . macrolide doxy- . macrolide clarithromycin,
 cycline *S. pneumoniae* azithromycin, roxithromycin, dirithromycin in
*H. influenzae*가 가 vitro *M. pneumoniae*, *C. pneumoniae*, *L.*
 , pneumophila *S. pneumoniae* *H. influen-*
 (2)가 zae 가 ,
 (3, 4 : , 2) 60 *H.*
 . influenzae (1, 2).
 Penicillin β - lactam β - lactam 10%
S. pneumoniae , peni- ,
 cillin cephalosporin β - lactam ,
Mycoplasma pneumoniae, *Chlamydia pneumoniae*,
Legionella pneumophila 가 . ,
 erythromycin macrolide가 가 .

6. Group 가 & '±' (2, 4)

	*	§
<i>S. pneumoniae</i> (DRSP)	1. β - lactam(cefpodoxime,	가. :
<i>M. pneumoniae</i>	cefuroxime, amoxicillin,	macrolide
<i>C. pneumoniae</i>	Amox./clav ; IV ceftriaxone	fluoroquinolone
Mixed infection	oral cefpodoxime)	:
(+ virus)	Plus	1. fluoroquinolone
<i>H. influenzae</i>	Macrolide or doxycycline †	2. macrolide+ β - lactam**
Enteric gram - negatives	2. fluoroquinolone †	
()		
Respiratory virus		
: <i>Moraxella catarrhalis</i> ,		
<i>Legionella</i> , (anaerobes),		

* , 3 (5)
 † amoxicillin 8 1g ; erythromycin *H. influenzae* amoxicillin doxycycline
 macrolide
 ‡ fluoroquinolone : gatifloxacin, moxifloxacin, levofloxacin, gemifloxacin
 *§
 ** - lactam : amoxicillin, amoxicillin/clavulanic acid, cefpodoxime, cefprozil, cefuroxime 1

Group II. 가

가

cephalosporin *S. pneumoniae*

in vitro cefpodoxime > cefuroxime > cefprozil > cefixime > cefaclor = loracarbef > cefadroxil = cephalexin (3).

DRSP, (1, 2)

β - lactam (cefpo-

Group I .

doxime, cefuroxime, amoxicillin, Amoxcillin/clavulanic acid 875mg/125mg bid ; IV ceftriaxone oral cefpodoxime) macrolide fluoroquinolone (2).

*S. pneumoniae*가 가

가 .

Amoxicillin *H. influenzae*가 cover macrolide doxycycline

Legionella sp.

가 (2). β - lactam ceftriaxone macrolide doxycycline

(6)(2).

5%

(2).

20%

(1). 50~90%

1~2

7. Group .

(2, 4)

a. Cardiopulmonary disease ± modifying factor		가	:
<i>S. pneumoniae</i> (DRSP)	1. IV β - lactam*(cefotaxime, ceftriax-	1.	fluoroquinolone
<i>H. influenzae</i>	one, ampicillin/sulbactam,	2.	macrolide+ β- lactam†
<i>M. pneumoniae</i>	ampicillin)		
<i>C. pneumoniae</i>	Plus		
Mixed infection(+)	Macrolide (IV or PO) or doxycycline †	.	:
Enteric gram - negatives		1.	macrolide+ β- lactam†
Aspiration (anaerobes)	2. fluoroquinolone IV	2.	fluoroquinolone
Virus			
<i>Legionella</i> spp.			
: , <i>Pneumocystis carinii</i>		()
b.			
<i>S. pneumoniae</i>	1. IV azithromycin (macrolide		
<i>H. influenzae</i>	allergy Doxycycline plus		
<i>M. pneumoniae</i>	β - lactam ; , Gram		
<i>C. pneumoniae</i>			
Mixed infection(+)			
Virus	2. fluoroquinolone		
<i>Legionella</i> spp.			
: , <i>Pneumocystis carinii</i>			

* Antipseudomonal agents cefepime, piperacillin/tazobactam, imipenem, meropenem *S. pneumoniae*
Pseudomonas aeruginosa

† β - lactam β - lactamase doxycycline macrolide cover가 .

* β - lactam : cefotaxime, ceftriaxone, ampicillin/sulbactam, ertapenem

roquinolone macrolide+
 Amoxicillin/ clavulanic acid amoxicillin β - lactam β - lactam 가
 (amoxicillin macrolide) 가, fluoroquinolone (4).
 clindamycin fluoroquinolone ,
 metronidazole 가 (2). macrolide amoxicillin(1g 3)
 3 , macrolide amoxicillin .
 amoxicillin 875mg/clavulanic
 (5), *S. pneumoniae* acid 125mg 2 2 .
 가 가
 . 3 fluo- . 3 flu-

oroquinolone β -lactam , 가 Legionella sp. 가 가 .
가 . , , , 가
60
macrolide fluo- 5~25%
roquinolone (6). 7 (2).
macrolide .
fluoro-
quinolone , macrolide β - 10%
lactam . β -lactam 40% (2).
amoxicillin, amoxicillin/clavulanic acid, cefpo-
doxime, cefprozil, cefuroxime . β -lactam macrolide
amoxicillin/clavulanic acid fluoroquinolone (7 a).
clindamycin . S. pneumoniae가 β -lactam
 β -lactam() macrolide
fluoroquinolone (6). .
(1).
Group III. 가
ampicillin/sulbactam, ampicillin,
 β -lactam 가
(3, 4) clindamycin metron-
group IIIa , idazole 가 (2).
S. pneumoniae, , group IVb(7 b)
가 . S. pneumoniae, H. influenzae, azithromycin fluoroqui-
(), gram - negative bacilli, 500mg 2~5 가 1 500mg 7~10
Legionella sp., S. aureus, C. pneumoniae, Respira- H. influenzae
tory viruses , M. pneu- 가
moniae, Moraxella catarrhalis, M. tuberculosis .
(7 a).
fluoroquinolone macrolide

8. Group . ICU (2, 4)

		*	*
a. <i>P. aeruginosa</i>			
<i>S. pneumoniae</i> (DRSP)		IV β - lactam (cefotaxime, ceftriaxone)†	IV β - lactam‡
<i>Legionella</i> spp.		Plus	Plus
<i>H. influenzae</i>		IV Macrolide(azithromycin)	macrolide
Enteric gram negative bacilli			fluoroquinolone
<i>S. aureus</i>			
<i>M. pneumoniae</i>		IV fluoroquinolone	β - lactam allergy :
Respiratory virus			fluoroquinolone
: <i>C. pneumoniae</i> ,			± clindamycin
b. <i>P. aeruginosa</i> (, , ICU)			
		1. Selected IV anti - pseudomonal β - lactam(cefepime, imipenem, meropenem, piperacillin/tazobactam) Plus	1. Antipseudomonal agent † Plus Ciprofloxacin
		IV anti - pseudomonal quinolone (ciprofloxacin)	2. Antipseudomonal agent Plus
All of the above pathogen plus		2. Selected β - lactam(cefepime, imipenem, meropenem, piperacillin/tazobactam) † Plus IV aminoglycoside Plus	aminoglycoside Plus
<i>P. aeruginosa</i>		IV macrolide or IV non - pseudomonal fluoroquinolone	fluoroquinolone macrolide β - lactam allergy :
			1. Aztreonam Plus levofloxacin (750mg)
			2. Aztreonam Plus moxifloxacin gatifloxacin ± aminoglycoside

* fluoroquinolone

† Antipseudomonal agents cefepime, piperacillin/tazobactam, imipenem, meropenem

S. pneumoniae *H. influenzae* 가 *Pseudomonas aeruginosa*

‡ β - lactam 가 , β - lactam aztreonam aminoglycoside fluoroquinolone

§ β - lactam : cefotaxime, ceftriaxone, ampicillin/sulbactam, ertapenem

β - actam (7).

Group IV.

β - lactam cefotaxime, ceftriaxone, ampicillin/sulbactam, ertapenem (4).

1 1 ertapenem ceftriaxone

S. pneumoniae, *H. influenzae*,

Legionella pneumophila (8).

가 (4).

, , (4). β -lactam allergy가 fluoroquinolone
 . *Pseudomonas aeruginosa* clindamycin 가 .
Pseudomonas aeruginosa
 10mg *Pseudomonas* 가
 prednisolone *S. pneumoniae* legionella가
 , 1 1 , (8 b)(2). *Pseudomonas aeruginosa*
 , β -lactam 가
 (2)(2). *S. aureus*가 1~22% β -lactam aztreonam aminoglyco-
 , , (2). side fluoroquinolone .
M. pneumoniae, Respiratory viruses β -lactam 가
 . 50% aztreonam levofloxacin(750mg) 가
 fluoroquinolone aztreonam moxifloxacin gati-
 . *P. aeruginosa* floxacin 가 aminoglycoside 가
 (4).
S. pneumoniae β -lactam *P. aeruginosa*
 cefotaxime ceftriaxone 가 azithromycin
 fluoroquinolone (8 가
 a)(2). erythromycin .
 Antipseudomonal agents cefepime, piperacillin/
 tazobactam, imipenem, meropenem (11).
S. pneumoniae 가 Aminoglycosides
Pseudomonas aeruginosa 가
 ,
 fluoroquinolone 가 . *Pseudo-*
monas aeruginosa
Pseudomonas aeruginosa .
 β -lactam macrolide
 fluoroquinolone ,
 β -lactam cefotaxime, ceftriaxone, .
 ampicillin/sulbactam, ertapenem 가 가

가 .

Doxycycline, minocycline, chloramphenicol, sulfamethoxazole - trimethoprim, fluoroquinolones, linezolid 가

(1, 2).

가

가 (1~4). 7~14 가

가 (2). *S. pneumoniae* 7~10 (2) 72 . Metronidazole, amoxicillin/clavulanic acid, amoxicillin, clindamycin

(4) 가 가 가

가 가 . Cefuroxime, ampicillin, erythromycin, flucloxacillin

(2). *C. pneumoniae* 7~14 (4). *Legionnaires* 가 10~14 가 ceftriaxone cefixime, cefotaxime cefpodoxime

14 . Ceftazidime

10~21 ciprofloxacin 가

(2, 4). *M. pneumoniae* 10~14 (2) .

가 가

S. aureus, *P. aeruginosa*, *Klebsiella species*, (8

2 (4). 2 100 / 37.8),

14~21 , azithromycin 5 (2).

가 . Azithromycin half-life가 11~14 erythromycin 1.5~3 , clarithromycin

3.8

fluoroquinolone 7 가 (2).

(2). 28~42

4~5 (13).

가 95%

(1, 7).

가 , .

S. aureus

24~48

(2).

24~48

가

Pseudomonas aeruginosa

M. pneumoniae

(4).

48~72

가 (4).

가

72

(2).

2~4

, *S. pneumoniae*

10%

2.5

6~7

(2).

M. pneumoniae

1~2

. *S. pneumoniae*

가

, *Legionella*

가

Legionella

5

가 4

P. carinii,

가

20~40%

7

(1, 6).

S. pneumoniae

50

, bronchiolitis obliterans organizing

X - ray

4

60%

pneumonia, Wegener

가

X -

가

ray

25%

4

X - ray

가

. *M. pneumoniae*

S.

pneumoniae

X - ray

, *Legio-*

. 72

nella sp.

가

6.5%,

가 72

가

7%

41%

Legionella sp.

, *P. carinii*,

protected specimen brush

가

가

가

가 가

가

65

, asplenia,

, Hodgkin

, HIV

S. pneumoniae

가 가

influenza

(4). 5~6

가 65

(2).

가

2

가

가

가

가

가

가

2

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